Seasonal prediction of UK regional precipitation using atmospheric drivers

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Recent advances in seasonal forecasting capability mean that the Met Office's seasonal forecast system (GloSea5) can skilfully represent the large-scale atmospheric circulation, such as the NAO (Scaife et al., 2014). We show that the large-scale circulation forecasts can be used to provide skilful forecasts of UK regional precipitation.

A simple multiple linear regression model is developed to describe the observed (HadUKP) winter precipitation variability in nine UK regions, using two pressure-based indices. Precipitation in the north-west of the UK is driven mainly by a pressure dipole, similar to the NAO but shifted to the east; precipitation in the south-east of the UK is driven by low pressure centred over the UK; other areas are driven by a combination of these two modes of pressure variability. The multiple linear regression model describes up to 76% of the observed precipitation variability in each region.

GloSea5 hindcasts are shown to skilfully represent these two pressure indices. Applying the multiple linear regression model to GloSea5 hindcasts is shown to give improved skill over the precipitation forecast by the model, and significant skill in five of the nine UK regions.

This simple statistical downscaling methodology has potential to provide useful regional precipitation input to seasonal hydrological forecast models, and could also be applied to climate model output to provide projections of regional-scale precipitation changes.